CLAIM AMENDMENTS

The following is a complete list of claims. The claims below replace all prior versions of the claims in the application. Please cancel claims 8, 9, 14, 17 – 21, 24, 27, 28, 31 – 33, 36, 55 – 57. Please add new claims 72 and 73. Please amend claims 1, 12, 13, 15, 16, 22, 26, 53, 54 and 58.

1. (Currently Amended) An apparatus to determine the proximity of a dental instrument to a tooth's apical foramen while the instrument is in the tooth's canal, the apparatus comprising:

a handpiece that includes:

a dental instrument operable to remove tissue from a tooth of the patient,

a handpiece driver ~~mechanically coupled to the dental instrument and~~ operable to drive the dental instrument via a mechanical coupling between the handpiece driver and the dental instrument, ~~to remove tissue,~~ and

an electrically conductive path that includes at least a portion of the mechanical coupling between the dental instrument and the handpiece driver;

a signal generator coupleable to body tissue of a patient and to the handpiece, wherein, while the signal generator is coupled to the body tissue and the handpiece, the signal generator generates a voltage signal that is used to determine the proximity of the dental instrument to the tooth's apical foramen, and that travels ~~across the body tissue and~~ the electrically conductive path; and

a microprocessor coupleable to the ~~dental~~ handpiece and that, while coupled to the ~~dental~~ handpiece and while the instrument removes tissue from the patient's tooth,

senses the voltage signal after the voltage signal has been modified by the impedance of the patient's body,

demodulates the modified voltage signal to isolate the modified voltage signal from electrical noise received via the electrically conductive path between the dental instrument and the handpiece driver, and

compares the modified voltage signal to the voltage signal generated by the signal generator.

2. (Previously Presented) The apparatus of claim 1, wherein the voltage signal includes an amplitude and a frequency.

3. (Previously Presented) The apparatus of claim 1, wherein:

the voltage signal has an amplitude and a frequency, and

the microprocessor compares the amplitude of the voltage signal generated by the signal generator to the amplitude of the modified voltage signal.

4. (Previously Presented) The apparatus of claim 1, further comprising a reference impedance coupled to the signal generator and the handpiece such that the reference impedance and the handpiece are arranged in series relative to each other, and the signal generator generates a voltage signal across the combination of the reference impedance, the handpiece and the body tissue, wherein the reference impedance is known.

5. (Previously Presented) The apparatus of claim 1, wherein in response to comparing the modified voltage signal to the voltage signal generated by the signal generator, the microprocessor generates a proximity signal that represents the proximity of the dental instrument to the tooth's apical foramen.

6. (Previously Presented) The apparatus of claim 1, further comprising an analog-to-digital converter that digitizes the modified voltage signal.

7. (Previously Presented) The apparatus of claim 1, wherein:

the voltage signal has an amplitude and a frequency, and

the microprocessor determines the phase of the modified voltage signal relative to the voltage signal generated by the signal generator.

8. – 11. (Cancelled)

12. (Currently Amended) The apparatus of claim 4, ~~8,~~ wherein the reference impedance essentially consists of a resistive element.

13. (Currently Amended) The apparatus of claim 4, ~~8,~~ wherein the reference impedance comprises a resistive element and a reactive element.

14. (Cancelled)

15. (Currently Amended) The apparatus of claim 1, further comprising a ~~14, wherein the~~ signal conditioner that includes a low-pass noise filter to isolate the modified voltage signal. ~~coupled between the second node and the microprocessor.~~

16. (Currently Amended) The apparatus of claim 15, ~~14,~~ wherein the signal conditioner includes an amplifier to amplify the modified voltage signal. ~~coupled between the second node and the microprocessor.~~

17. – 21. (Cancelled)

22. (Currently Amended) The apparatus of claim 1, ~~8,~~ wherein the proximity indicator includes a haptic device.

23. – 25. (Cancelled)

26. (Currently Amended) The apparatus of claim 1, ~~8,~~ wherein the generated voltage ~~divider~~ signal consists essentially of a single frequency.

27. – 46. (Cancelled)

47. (Previously Presented) The apparatus of claim 5 wherein the proximity signal is generated from a look-up table that is stored in the apparatus.

48. (Previously Presented) The apparatus of claim 5 wherein the proximity signal is generated from an equation that is stored in the apparatus and executed by the microprocessor.

49. (Previously Presented) The apparatus of claim 1 wherein the microprocessor executes a synchronous demodulation algorithm to demodulate the modified voltage signal from electrical noise received via the electrically conductive path between the dental instrument and the handpiece driver.

50. (Previously Presented) The apparatus of claim 1 wherein the microprocessor performs a fast Fourier transform of the modified voltage signal to demodulate the modified voltage signal from electrical noise received via the electrically conductive path between the dental instrument and the handpiece driver.

51. (Previously Presented) The apparatus of claim 1 wherein the microprocessor performs a single-frequency fast Fourier transform of the modified voltage signal to demodulate the modified voltage signal from electrical noise received via the electrically conductive path between the dental instrument and the handpiece driver.

52. (Previously Presented) The apparatus of claim 1 wherein the microprocessor executes a convolving algorithm to demodulate the modified voltage signal from electrical noise received via the electrically conductive path between the dental instrument and the handpiece driver.

53. (Currently Amended) The method of claim 58, further comprising impeding the generated voltage signal with a ~~27 wherein the~~ reference impedance that includes a resistive element.

54. (Currently Amended) The method of claim 58, further comprising impeding the generated voltage signal with a ~~27 wherein the~~ reference impedance that includes a reactive element.

55. – 57. (Cancelled)

58. (Currently Amended) A method for indicating the proximity of a dental instrument to a tooth's apical foramen, the method comprising:

generating a voltage signal across a combination of body tissue of a patient and a handpiece, wherein the handpiece ~~that~~ includes:

a dental instrument disposed in the tooth's root canal,

a handpiece driver ~~mechanically coupled to the dental instrument~~ to drive the instrument via a mechanical coupling between the handpiece driver and the dental instrument, and

an electrically conductive path that includes at least a portion of the mechanical coupling between the driver and instrument,

wherein the combination includes the handpiece's electrically conductive path and the body tissue arranged in series relative to each other, and wherein the voltage signal is used to determine the proximity of the dental instrument to the tooth's apical foramen;

passing the voltage signal through the electrically conductive path;

impeding the signal with the body tissue;

while the dental instrument removes tissue from the tooth, sensing the voltage signal after the voltage signal has been modified by the impedance of the patient's body tissue;

demodulating the modified voltage signal to isolate the modified voltage signal from electrical noise received via the electrically conductive path; and

comparing the modified voltage signal to the generated voltage signal.

59. (Previously Presented) The method of claim 58, wherein generating the voltage signal includes generating a signal that includes an amplitude and a frequency.

60. (Previously Presented) The method of claim 58, wherein the voltage signal consists essentially of a single frequency.

61. (Previously Presented) The method of claim 59 wherein comparing the modified voltage signal to the generated voltage signal includes comparing their amplitudes.

62. (Previously Presented) The method of claim 59 wherein comparing the modified voltage signal to the generated voltage signal includes comparing the phase of the modified voltage signal relative to the phase of the generated voltage signal.

63. (Previously Presented) The method of claim 59 wherein comparing the modified voltage signal to the generated voltage signal includes comparing their amplitudes and the phase of the modified voltage signal relative to the phase of the generated voltage signal.

64. (Previously Presented) The method of claim 58, wherein sensing the modified voltage signal includes amplifying the modified voltage signal.

65. (Previously Presented) The method of claim 58, wherein demodulating the modified voltage signal includes filtering noise from the modified voltage signal.

66. (Previously Presented) The method of claim 58 wherein demodulating the modified voltage signal includes performing at least one of the following: a synchronous demodulation algorithm, a fast Fourier transform, a single frequency fast Fourier transform, and a convolving algorithm.

67. (Previously Presented) The method of claim 58 further comprising generating a proximity signal based on the signal comparison.

68. (Previously Presented) The method of claim 67 further comprising indicating a proximity of the dental instrument to the apical foramen based on the proximity signal.

69. (Previously Presented) The method of claim 67 wherein generating a proximity signal includes retrieving data from a lookup table that correlates at least one signal comparison with a proximity of the dental instrument to the apical foramen.

70. (Previously Presented) The method of claim 67 wherein generating a proximity signal includes executing an equation that correlates at least one signal comparison with a proximity of the dental instrument to the apical foramen.

71. (Previously Presented) The method of claim 67, wherein indicating the proximity of the dental instrument to the apical foramen includes updating the proximity signal.

72. (New) An apparatus to determine the proximity of a dental instrument to a tooth's apical foramen while the instrument is in the tooth's canal, the apparatus comprising:

a handpiece that includes:

a dental instrument operable to remove tissue from a tooth of the patient,

a handpiece driver operable to drive the dental instrument via a mechanical coupling between the handpiece driver and the dental instrument, and

an electrically conductive path that includes at least a portion of the mechanical coupling between the dental instrument and the handpiece driver;

a signal generator coupleable to body tissue of a patient and to the handpiece, wherein, while the signal generator is coupled to the body tissue and the handpiece, the signal generator generates a voltage signal across the body tissue and the electrically conductive path, wherein the voltage signal generated by the signal generator passes through the handpiece driver to the dental instrument; and

a microprocessor coupleable to the handpiece and that, while coupled to the handpiece and while the instrument removes tissue from the patient's tooth,

senses the voltage signal after the voltage signal has been modified by the impedance of the patient's body,

demodulates the modified voltage signal to isolate the modified voltage signal from electrical noise received via the electrically conductive path between the dental instrument and the handpiece driver, and

compares the modified voltage signal to the voltage signal generated by the signal generator.

73. (New) A method for indicating the proximity of a dental instrument to a tooth's apical foramen, the method comprising:

generating a voltage signal across a combination of body tissue of a patient and a handpiece, wherein the handpiece includes:

a dental instrument disposed in the tooth's root canal,

a handpiece driver to drive the instrument via a mechanical coupling between the handpiece driver and the dental instrument, and

an electrically conductive path that includes at least a portion of the mechanical coupling between the driver and instrument,

wherein the combination includes the handpiece's electrically conductive path and the body tissue arranged in series relative to each other;

passing the voltage signal through the handpiece driver to the dental instrument;

impeding the signal with the body tissue;

while the dental instrument removes tissue from the tooth, sensing the voltage signal after the voltage signal has been modified by the impedance of the patient's body tissue;

demodulating the modified voltage signal to isolate the modified voltage signal from electrical noise received via the electrically conductive path; and

comparing the modified voltage signal to the generated voltage signal.